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measuring wool by STAPLE LENGTH RECORDER

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UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE
LIVESTOCK DIVISION

Marketing Research Report 668

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Special credit is given the Marketing Research Division, Quality Evaluation Section, of the Agricultural Marketing Service, for technical assistance in the development of the Wool Staple Length Recorder; also for the loan of the machine to the Denver Wool Laboratory, Standardization Branch, Livestock Division of the Agricultural Marketing Service, so that its application to measuring grease wool staples could be studied.

SUMMARY

Staple length is one of the most important measurable quality factors considered when assessing the utility and value of grease wool.

Present methods of determining unstretched (normal) staple length by measurement or visual estimation are relatively slow and not as precise as is desirable.

A machine was needed that would quickly and precisely determine average unstretched staple length of grease wool and eliminate operator differences and individual bias. Such a machine, known as the Wool Staple Length Recorder, was designed and manufactured for the U.S. Department of Agriculture by the United States Testing Company of Hoboken, New Jersey.

From a study of the Wool Staple Length Recorder, both in the laboratory and in wool warehouses, the following observations can be made:

(1) An electronic machine has been developed that will repeatedly measure the average staple length of grease wool staples accurately.

(2) The machine is sturdily built and is unaffected by normal shipping and transportation procedures. It operates equally well in the laboratory or in the warehouse.

(3) No special skill or long training is required to operate the machine and the length results are not influenced by insertion of the staples tip first or base first.

(4) Measurements made by the machine are precise, usually agreeing with the ruler measurement on a group of staples within 0.05 inch and differing seldom over 0.10 inch.

(5) Repeatability in results of average length on the same group of staples is usually within 0.04 inch.

(6) One hundred staples can be measured in from 8 to 22 minutes, depending on the length and condition of the staples.

(7) The Wool Staple Length Recorder is not satisfactory for determining the staple length on scoured wool or mohair.

Mention of commercial products in this publication does not imply endorsement by the U.S. Department of Agriculture nor approval of the product to the exclusion of others which may also be suitable.

MEASURING WOOL BY STAPLE LENGTH RECORDER

By H. D. Ray, H. C. Reals, D. D. Johnston, and E. M. Pohle[1]

INTRODUCTION

Length of staple is an important property of wool. It has an influence on the price, the quantity of clean wool, the manner and cost of processing, and the end use.

In earlier publications (2), (4), and (5)[2] it was shown that unstretched (normal) staple length is more nearly representative of average fiber length of top than the stretched staple length. It has also been observed that staple length test results based on methods for determining unstretched length are easier for different operators to reproduce than those based on stretched length. Therefore, it is of basic importance in the uniform interpretation of length classes of grease wool and of considerable economic value to the producer, seller, buyer and manufacturer to develop a method that will quickly and objectively measure unstretched wool staples.

BACKGROUND OF STUDY

Present Methods of Developing Staple Length

Various methods have been used to estimate the average staple length of a sample or lot of wool.

In the rule-of-thumb procedure the staple is grasped at the tip by the thumb and index finger of one hand and at the base by the same fingers of the other hand. The staple is then pulled over the back of the thumb which holds the tip and down toward the wrist and a visual estimate of the length of the staple is made. Repetitions of this operation on a number of staples in a lot permit an estimation of the length classification of the lot.

Another method is to stretch strips of narrow white tape or string across black velvet boards. The distance between the strips of tape vary, starting with 1/2 inch and increasing by 1/4 inch intervals until the widest distance is at least equal to the longest staple that the operator anticipates measuring. The staples to be measured are placed between the lines that most nearly represent the staple length. When all the staples representing a lot are so placed, the number in each length interval is counted and recorded. The average staple length and length distribution can then be quickly calculated from these data.

A third method is the actual measurement, with a ruler to the nearest 1/4 inch, of each staple drawn from a lot of wool. The measurements are then averaged to obtain the average staple length of the lot. If desired, length distribution information can also be determined from these measurements. This method, which is described in detail by the American Society for Testing and Materials' Standards on Textile Material (1), is the procedure that was followed in all ruler measurements discussed in this study.

The various methods of staple measurement referred to above all have value in estimating the average staple length of a fleece or lot of wool; however, each is subject to human bias and subjective interpretation. Agreement between laboratories, and sometimes between operators within a laboratory, has not always been as accurate as desired.

Development of the Wool Staple Length Recorder

The need for a mechanical device that is simple to use and that would rapidly measure wool staples objectively and with precision has long been sought.

In 1959, specifications were established by the Market Quality Research Division in cooperation with the Livestock Division Wool Laboratory.

The United States Testing Company, Inc., 1415 Park Avenue, Hoboken, New Jersey, contracted in June of 1959 to design and construct their new electronic device.

The machine, labeled by the manufacturer as a "Wool Staple Length Recorder" and often referred to in this report as the "Length Recorder," was assigned for study to the Denver Wool Laboratory of USDA's Agricultural Marketing Service in January 1960.

This is a report on this Length Recorder, a brief description of the machine and its operation, an evaluation of its precision in measuring various types of wool, data on the time required to measure wools of different lengths, and suggestions for improvements.

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[1] Wool Laboratory, Standardization Branch, Livestock Division, AMS, Denver, Colorado.

[2] Underscored numbers in parentheses refer to literature cited, page 9.

WOOL STAPLE LENGTH RECORDER

Physical Description

A photograph of the recorder and data printer in operation is shown on the front cover of this publication. The electronic components and working parts of the machine are housed in a metal cabinet 18 by 22 inches and 23 inches high. A shelf extending completely across the front and located 6 inches down from the top reaches out 20 inches from the cabinet. At the Denver Wool Laboratory, a low steel platform was built on which the machine was placed. The platform is 10 inches high and is fitted with casters, making it easy to move the machine about. Total weight of the Length Recorder with the data printer is 212 pounds.

With the Wool Staple Length Recorder mounted on the platform, the "shelf," or front tray, is approximately 27 inches from the floor, which makes it convenient for the operator in a sitting position.

Part of the equipment consists of a Clary parallel entry numerical data printer. This printer can be placed on top of the Length Recorder cabinet or on a nearby table. An electrical cable extends from the printer to the left side of the cabinet. A foot switch for activating the data printer can be located wherever the operator finds it convenient.

Two switches are mounted on the front panel. The upper one is labeled "Wool Transport and Printer Power;" the lower one, "Gate and Count Chassis."

Two counters are located on the right-hand side of the front panel. The upper one, labeled "Total Length--0.1 In.," records and accumulates the total length of a staple, or lot of staples, to the nearest 0.1 inch. The lower counter, marked "Staple Count;" counts the number of individual staple measurements which have been printed.

A formed opening, into which wool staples are inserted one at a time, for measuring, is located near the forward edge of the shelf of the instrument. This opening is called the "wool receptacle."

Principle of Operation

The manufacturer lists the principle of operation of the Length Recorder as follows:

1. Staples are inserted end-wise into the opening on the shelf of the instrument cabinet. The leading end of the staple is grasped between flanges on a pair of moving belts and the staple is drawn through the opening. This action causes the staple to be straightened (but not stretched) as it is carried along by the belts under a slight amount of tension.

2. The staple is then carried length-wise through a light beam which passes through an opening between the belts. When the light beam is interrupted by the wool staple, an electronically-controlled gate is opened, allowing electrical pulses to pass. When the staple leaves the beam, the gate closes again.

3. The electrical pulses are created by a mechanical pulsing device, which operates whenever the belt is in motion. The pulsing device is mechanically coupled to the main belt drive so that it creates one pulse for each tenth of an inch of belt travel.

4. When the gate is open, the pulses are passed to two separate devices: One is a digital counting-storage system, and the other is a magnetically-actuated pulse counter.

5. The digital counter-storage system is composed of a pair of rotary stepping switches which step once for each pulse received. Hence, when the pulse gate closes, they have stored the length of the staple in tenths of inches. The information is then printed on a data printer by depressing a foot switch (recording from 0.1 to 9.9 inches). In addition to printing the data, the printer keys a reset relay which returns the stepping switches to their "home" position and simultaneously actuates a pulse counter which records the number of staples measured.

6. The magnetically-actuated counter to which the pulses are passed does not reset and, therefore, will indicate the total length of a group of staples.

7. The staples are carried to the rear of the instrument by the belts, where they are discharged.

When the operator completes the measurement of a group of staples, he has the following information:

1. The number of staples measured;
2. The total accumulated length of all staples measured;
3. A printed record of the length of each individual staple.

SAMPLING AND PREPARATION PROCEDURES

Length measurement testing of grease wool staples by this machine was initiated upon its arrival at the Denver Wool Laboratory. Since that time extensive use has been made of the machine for the measurement of grease wool staples from many grades and types of wool. It has not only been used in the laboratory, but has been transported across the country and used under varying conditions in wool warehouses from coast to coast.

Whenever possible, staples were drawn by means of a wool staple sampling tool, following procedures and schedules recommended by the U.S. Department of Agriculture (3).

Before measuring, the staples were reduced to a uniform size of approximately 1/4-inch in diameter. However, subsequent work with the Length Recorder has revealed that the diameter of the wool staple is not critical and considerable latitude may be permitted in staple size with satisfactory results. For this study the staples representing a lot of wool were subdivided into smaller groups in order to check the repeatability and accuracy of the Length Recorder on small numbers of staples.

TESTING WOOL STAPLE LENGTH RECORDER

Several tests of the Length Recorder were made over an extended period. The test measurements of grease staples on various types and grades of wool were designed and carried out to obtain the following information: (a) the most desirable way to insert the staple into the wool receptacle; (b) the degree of agreement between the results of grease wool staples measured in the Length Recorder and results obtained by the ruler measurement on the same samples; (c) the degree of repeatability of results by the Length Recorder on the same staple or groups of staples; (d) the degree of agreement between the data printer and the total length counter on the same samples.

Test One

Method of inserting staples--Since the Length Recorder was a prototype and involved a completely new principle in staple length measurement, it was not known whether it was more desirable to insert the staples into the wool receptacle base first (flesh end) or tip first (weather end). In an effort to determine if one method was more advantageous than the others, seven samples of 100 staples per sample were drawn from a lot of wool. Each sample was measured in the Length Recorder, base first and then tip first. The data are given in table 1.

Examination of the total length counter in table 1 shows that the base-first measurement was longer than the tip-first measurement by 0.04 of an inch in one sample (sample 4). The tip-first measurement was longer than the base-first measurement in four cases but never more than 0.03 of an inch. There was perfect agreement between tip-first and base-first measurements in two samples.

The data printer measurements show much the same pattern with the base-first measurement being longer than the tip-first measurement in two cases (samples 1 and 5). The tip-first measurements were longer than the base-first measurements four times and the two methods were in agreement in one instance.

From the data in table 1, no trend can be seen as to whether base-first or tip-first measurements are perferable. All differences between the two methods of measurement are within the error limits of one-tenth of an inch specified by the manufacturer.

Agreement between data printer and total length counter--It is interesting to note in table 1, when the 1400 measurements by the total length counter are averaged and then

Table 1.--A comparison of the average length obtained from measuring the same staples base first and tip first

Sample number	Insertion method	Average length total length counter	Average length data printer
		Inches	Inches
1.	Base first	2.79	2.88
1.	Tip first	2.81	2.80
2.	Base first	2.92	2.92
2.	Tip first	2.94	2.94
3.	Base first	2.76	2.75
3.	Tip first	2.78	2.80
4.	Base first	2.84	2.78
4.	Tip first	2.80	2.80
5.	Base first	2.71	2.72
5.	Tip first	2.72	2.71
6.	Base first	2.81	2.78
6.	Tip first	2.81	2.78
7.	Base first	2.88	2.88
7.	Tip first	2.88	2.89
Average		2.82	2.82

compared with the average length of all measurements by the data printer, there is no difference.

Test Two

The data of Test Two are the result of three measurements by the Length Recorder on five groups of staples, each group containing ten staples which had previously been measured by means of a ruler. The data are listed in table 2.

Agreement between data printer and total length counter--In Test Two the greatest difference in average staple length between the total length counter and the data printer within a group was 0.04 of an inch. The greatest difference between the results of the total length counter and the data printer on any one test was 0.02 of an inch. In seven of the tests there was complete agreement between the total length counter and the data printer in each case.

Repeatability of results on the same group of staples--On the repeated measurements of the five groups of staples the difference in average

Table 2.--Total length counter and data printer results compared with ruler measurements on 5 groups of staples with repeat measurements on each group

Group number and repeat measurements	Average staple length by	
	Total length counter	Data printer
	Inches	Inches
Group 1 (10 staples)		
1st measurements.....	2.62	2.62
2nd measurements.....	2.66	2.66
3rd measurements.....	2.65	2.63
Average.....	2.64	2.64
Group 2 (10 staples)		
1st measurements.....	2.67	2.67
2nd measurements.....	2.66	2.65
3rd measurements.....	2.64	2.64
Average.....	2.66	2.65
Group 3 (10 staples)		
1st measurements.....	2.68	2.68
2nd measurements.....	2.70	2.68
3rd measurements.....	2.72	2.71
Average.....	2.70	2.69
Group 4 (10 staples)		
1st measurements.....	2.62	2.60
2nd measurements.....	2.63	2.63
3rd measurements.....	2.60	2.60
Average.....	2.62	2.61
Group 5 (10 staples)		
1st measurements.....	2.57	2.56
2nd measurements.....	2.56	2.55
3rd measurements.....	2.53	2.54
Average.....	2.55	2.55
Average 150 measurements....	2.63	2.63

Average length of above staples by ruler measurement = 2.62 inches.

length obtained on the same group was in no instance greater than 0.04 of an inch.

Ruler length measurements compared to Length Recorder measurements--The over-all average staple length of the 150 measurements (5 groups of 10 staples, each measured 3 times) was 2.63 inches by both the total length counter and the data printer. This agrees remarkably well with the ruler measurement of 2.62 inches on the same staples.

Test Three

Test Three was performed on grease staples representing six grades of wool. Twenty staples were drawn at random from each grade. These staples were then measured twice in the Wool Staple Length Recorder and once by means of a ruler. A summary of the measurement results is given in table 3.

Agreement between data printer and total length counter--The data in Test Three show excellent agreement in comparing the average length measurement on the data printer with that on the total length counter in each of the six grades of twenty staples per grade. The greatest difference in the average length of any of the groups of twenty staples between the counter and the data printer on the same test was 0.02 inch and in five of the twelve comparisons, there was no difference.

Repeatability of results on the same group of staples--In demonstrating the repeatability of the counter in table 3 it is seen that, in measuring the same six groups of staples twice, the same average length was obtained on both measurements in one group (1/2 blood French). The greatest difference between measurements on the same lot was 0.05 inch on the 3/8 blood staple. The average difference in average length on the counter between all the first and second measurements was 0.027 inch.

The results of the first and second measurements on the data printer can be seen in table 3. The greatest difference in average length between the first and second measurements on any one lot was 0.04 inch. This was found on two lots (Fine French and 3/8 blood staple). In two of the lots (1/2 blood staple and 1/2 blood French), identical average length results were obtained between the first and second measurements. In the six lots shown in table 3 the average difference on the printer between the first and second measurements was 0.021 inch.

Repeatability of results on the same staples--In regard to the agreement on individual measurements between the counter and the data printer, on the 240 staple measurements represented in table 3 (six lots of twenty staples; each lot measured twice), the printer and the counter were in perfect agreement in 222 of the measurements and were

Table 3.--Staple length measurements on six lots of wool by the Wool Staple Length Recorder, giving average length on first and second measurements by data printer and total length counter as compared to ruler measurement on the same twenty staples per lot

Grade	Measurements	Average length total length counter	Average length data printer	Average length ruler
		Inches	Inches	Inches
Fine staple	1st	3.59	3.58	3.36
	2nd	3.56	3.56	
Fine French	1st	2.70	2.70	2.56
	2nd	2.66	2.66	
1/2 blood staple	1st	3.84	3.84	3.70
	2nd	3.86	3.84	
1/2 blood French	1st	3.01	3.00	2.84
	2nd	3.01	3.00	
3/8 blood staple	1st	3.84	3.82	3.61
	2nd	3.79	3.78	
1/4 blood staple	1st	4.04	4.03	3.91
	2nd	4.06	4.06	
Average		3.50	3.49	3.33

different in only eighteen instances. Where there was a difference between the tape and the counter on the same staple measurement, the difference was 0.1 inch seventeen times and 0.2 inch once. In the eighteen instances where the tape and counter were not in perfect agreement, the tape printer measured the staple shorter than the counter in every instance but one.

Ruler length measurements compared to Length Recorder measurements--In contrast to the data in table 2, the measurements tabulated in table 3 show consistently shorter length measurements when measuring the staples with the ruler than with the length counter or the data printer on the Length Recorder. These differences ranged from as much as 0.24 inch less on the Fine French to 0.15 inch less on the 1/4 blood staple. This may have been due to operator differences in the ruler measurement.

Test Four

To obtain additional information as to the precision and repeatability of the Length Recorder, two sub-samples of 100 staples each were drawn at random from a lot of wool. The staples making up these sub-samples were measured with a ruler and then each group of 100 staples was measured three times in the Length Recorder. The data from these measurements of Test Four are summarized in table 4.

Agreement between data printer and total length counter--In comparing average staple length of each measurement by the counter and printer for Test Four it is seen that in no measurement of either sub-sample do they differ more than 0.02 of an inch.

Repeatability of results on same group of staples--In examining the data in table 4 it is seen that in each sub-sample the greatest difference in repeat measurements by the length counter was only 0.02 inch. The greatest difference in the repeat measurements by the data printer was 0.03 inch.

Ruler length measurements compared to Length Recorder measurements--Agreement with the ruler measurements is excellent; in the respective sub-samples no measurement by the Length Recorder differed more than 0.02 inch from the average staple length as determined by the ruler measurement.

Table 4.--Measurement by ruler and Wool Staple Length Recorder of two sub-samples of 100 staples each and with repeat measurements on each sub-sample.

Sub-sample and repeat measurements	Average length Wool Staple Length Recorder	
	Total length counter	Data printer
	Inches	Inches
Sub-sample 1		
1st measurements	2.65	2.66
2nd measurements	2.66	2.65
3rd measurements	2.67	2.65
Average.....	2.66	2.65
Ruler measurement:	2.65 inches	
Sub-sample 2		
1st measurements	2.57	2.55
2nd measurements	2.58	2.56
3rd measurements	2.59	2.58
Average.....	2.58	2.56
Ruler measurement:	2.57 inches	

Test Five

In order to determine the repeatability of the Length Recorder in measuring relatively short staples, 100 grease staples were drawn from each of two lines of short wool. One lot was graded fine and the other 1/2 blood. The staples from these lots were measured by two operators using the ruler measurement method. The staples were then measured twice by the Length Recorder, keeping a record of the average staple length as determined by the total length counter and the data printer in each measurement. The data of this test are summarized in table 5.

The results of these measurements showed excellent agreement between the first and second measurement on the Length Recorder and between the data printer and the total length counter in every measurement (table 5). All measurements by the Length Recorder were well within one-tenth of an inch of the ruler measurements by the two operators on each lot.

Table 5.--Average staple length on short and average French grease wool staples as determined by the Wool Staple Length Recorder and ruler measurement.

Lot number	Ruler measurement	Wool Staple Length Recorder				
		1st measurement		2nd measurement		Average all Recorder measurements
		Total length counter	Data printer	Total length counter	Data printer	
	Inches	Inches	Inches	Inches	Inches	Inches
1.	1.72	1.77	1.74	1.79	1.77	1.77
2.	1.64	1.71	1.70	1.70	1.69	1.70

MEASURING VARIOUS TYPES OF SAMPLES IN THE WOOL STAPLE LENGTH RECORDER

Scoured Wool Samples

Attempts to measure scoured wool staples in the Length Recorder were not satisfactory. The scoured wool staples have a tendency to curl and contract in length and require more straightening and handling to obtain a true staple length measurement than is the case with grease staples. Due to this condition, consistently shorter measurements were found on scoured wool staples when measured in the Length Recorder and the results of repeated measurements of a staple or group of staples did not show consistent results.

The physical properties of the scoured staples caused the fibers to have a greater tendency to become caught on the belt and prevent the machine from discharging the staples.

Mohair Locks

Limited testing of mohair locks was attempted; however, the wavy or "marcel" effect of the mohair lock caused an interruption in the measurement of some of the locks. With the typical tapering shape of the mohair lock along with its slick, silky characteristics, it was not held firmly enough by the belt to straighten it and obtain its full length. It is possible that a different type belt could be designed that would hold the lock more firmly and reduce this problem.

Another consideration is the development of a correction formula so that the measurement of mohair locks in the Length Recorder would be comparable to ruler measurements. However, this could be attempted only after much measuring of various grades of mohair, both by the ruler and the Length Recorder.

Almost all of the mohair locks had to be removed from the machine manually after measurement as the long, loose fibers would catch in the mechanism at the point where the locks are removed from the belt.

MEASUREMENT TIME WITH THE WOOL STAPLE LENGTH RECORDER

Time studies were carried on in order to gain information on the speed with which wool staples of various types, grades, and lengths could be measured in the Length Recorder. The data from these studies are tabulated in table 6. The times shown per 100 staples are the actual measurement time and do not include drawing the staples or stripping them down to measurement size.

As would be expected, the shorter staples require less time to pass through the machine and generally can be measured more rapidly. However, this is not always true. As shown in table 6 some of the short 3/8's and 1/4 blood staples required more time to measure than did some of the longer fine and 1/2 blood wools. This is because staples which are "ragged" or poorly defined require more time and care in handling and in inserting into the wool receptacle. Occasionally, these staples have to be removed manually from the machine, slowing down the measuring procedure.

The time required to measure 100 staples varied from 8 to 22 minutes. The average of all lots measured was 13 minutes.

Table 6.--Time required to measure 100 staples of various grades of wool by means of the Wool Staple Length Recorder

Lot description	Average length by Recorder	Measurement time per 100 staples
	Inches	Minutes
Fine French	1.7	8
Fine French	2.2	9
Fine and 1/2 clothing	2.2	10
Fine staple	3.0	10
Fine staple	3.0	10
Fine staple	3.2	10
1/2 blood French	1.8	10
1/2 blood French	2.5	12
1/2 blood staple	3.4	14
3/8 baby	2.5	10
3/8 baby	2.7	15
3/8 staple	3.4	16
3/8 staple	3.5	15
1/4 baby	3.0	13
1/4 baby	3.0	15
1/4 baby	3.2	14
1/4 staple	3.7	14
1/4 staple	4.1	20
Low 1/4 staple	4.7	15
Low 1/4 staple	4.0	12
Country pack--coarse	4.9	22
Average: all lots	3.1	13

LITERATURE CITED

(1) American Society for Testing and Materials, Committee D-13 on Textiles. 1961. Standard Methods of Sampling and Testing Length of Wool in the Grease. D1234-54, pp. 489-491, illus.

(2) Johnston, D. D., Ray, H. D., Manning, W. J., and Pohle, E. M. 1954. Relationship of Staple Length in Grease Wool and Resultant Top. U.S. Dept. of Agriculture 9 pp., illus. (Processed.)

(3) Johnston, D. D., Ray, H. D., and Pohle, E. M. 1957. Staple Length Sampling Schedules for Raw Wool Packaged in Bags. U.S. Dept. of Agriculture, Agricultural Marketing Service No. 182, 15 pp., illus. (Processed.)

(4) Johnston, D. D., Keller, H. R., Mueller, W. A., Ray, H. D., 1958. Reals, H. C., and Pohle, E. M. Physical Measurements and Their Application in Describing Wool. U.S. Dept. of Agriculture, Marketing Research Report No. 256, 51 pp., illus. (Processed.)

(5) Pohle, E. M., Johnston, D. D., Keller, H. R., Mueller, W. A., 1957. Ray, H. D., and Reals, H. C. Value-Determining Physical Properties and Characteristics of Domestic Wools. U.S. Dept. of Agriculture, Marketing Research Report No. 211, 67 pp., illus. (Processed.)

CONCLUSIONS AND SUGGESTIONS

From the foregoing data the following conclusions can be drawn:

1. Staples may be introduced into the Length Recorder tip-first or base-first for measurement. No significant difference in results was found between the two procedures.

2. Agreement between the total length counter and the data printer is confirmed. In the hundreds of staple measurements represented here, the difference between the two measurements on the same group of staples at no time reached 0.10 inch. Agreement was usually within 0.03 of an inch, which is very good.

3. The repeatability of the instrument was found to be excellent. In the repeat measurement of groups of staples, the average of each group seldom varied more than 0.02 or 0.03 inch and never as much as 0.10 inch.

4. The agreement of the Wool Staple Length Recorder with the staple measurement by ruler is, in most cases, very good. Usually the average of a group of staples agrees within 0.02 or 0.03 of an inch between the ruler measurement and the Wool Staple Length Recorder. In Test Three, the ruler measurement averaged about 0.15 inch less than the Wool Staple Length Recorder measurements on the six grades of wool. This may be due to extremely tippy wool or operator variation in the ruler measurements, or both.

5. No serious difficulty was encountered with the mechanical operation of the Wool Staple Length Recorder. The Clary data printer operates well and the tabulation of the number of staples passing through the recorder is dependable. Grease staples will get caught in the belt occasionally and are drawn into the machine if the operator is not alert enough to remove them.

6. The Length Recorder provides a means of assigning objectively determined staple length to lots of wool prepared for market. The use of this type machine by commercial testers or other organizations serving growers and buyers could provide useful information to clients by objectively describing staple length of grease wool.

Following are suggestions to be considered in the manufacture of additional Wool Staple Length Recorders:

1. Every effort should be made to make the Length Recorder smaller and more easily portable by increased use of light-weight metals and by replacing the conventional electron tube complement with transistors.

2. The data printer should be placed within the cabinet of the Wool Staple Length Recorder, making it an integral part of the machine.

3. The mechanism that removes the staples from the belt and discharges them from the machine should be redesigned so that the operation will become more fool-proof and not require the operator's attention during testing.

4. Handles should be provided near the base of the machine for easier carrying. These handles could be recessed into the cabinet.

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